



Specifications for SWC #503 Summer Road Maintenance

1. Scope

The purpose of this Invitation to Bid (“ITB”) is to provide Summer Road Maintenance Materials and Services such as asphalt, crushed stone, and parking lot sealing both picked up at the plant and delivered on-site (in place) to the State of Tennessee (“State”) Agencies and other Authorized Users as defined in Terms and Conditions Section 8.3.

2. Definitions

AASHTO T 88	Standard Method of Test For Particle Size Analysis of Soils: https://www.tn.gov/content/dam/tn/tdot/hq-materials-tests/training/training_books/Aggregate_Technician_Course_Manual.pdf
ADT	Average Daily Traffic
Authorized User	Authorized User shall have the meaning prescribed in Terms and Conditions Section 8.3.
EPA	Environmental Protection Agency.
GVWR	Gross Vehicle Weight Rating - maximum operating weight/mass of a vehicle as specified by the manufacturer including the vehicle's chassis, body, engine, engine fluids, fuel, accessories, driver, passengers and cargo but excluding that of any trailers.
Producer	Entity responsible for the production of a commodity
JMF	Job Mix Formula
NCHRP	National Cooperative Highway Research Program
Operational Hours	Monday through Friday 6:00AM-8:00PM, excluding legal State holidays. A listing of State holidays can be found at https://www.tn.gov/about-tn/state-holidays.html .
Small Quantities	Work orders/jobs equal to or less than 1000 tons for non-interstate routes, or less than 500 tons for interstate routes.
Contractor	Entity responsible for providing the State of Tennessee with a good or service.
TDOT	Tennessee Department of Transportation

TDOT Specification Document	Document outlining the current specifications for commodities to be placed on or near roadways. This document can be viewed at: https://www.tn.gov/tdot/tdot-construction-division/transportation-construction-division-resources/2021-standard-specifications.html
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3. Asphalt, Hot Mix

A. Authorized User Pick-Up Specifications

- i. General Specifications of Material
 1. Asphalt purchased as Authorized User Pick-Up shall be hauled from plant in End-User supplied vehicles and applied by Authorized User personnel.
 2. All Contractor-provided materials are to be in conformance with TDOT Specification Document for Road and Bridge Construction January 1, 2021, and any subsequent supplements or amendments.
 3. All mixtures shall have an approved job mix formula (JMF) in accordance with TDOT Specification Document, which may have been previously approved on other state projects during the calendar year, before any work is done. All plant mixtures shall be produced in accordance with sections 307, 403, 407, 411 and 903 of TDOT Specification Document. Information regarding this procedure can also be found at TDOT materials and test website: <http://www.tn.gov/tdot/materials-and-tests-home>.
- ii. Lab Test Requirements
 1. All plant testing shall be completed by TDOT-certified plant personnel only and in a TDOT-qualified laboratory. All Producer samples shall be split with one half retained for Authorized User random verification testing as needed.
 2. For work orders/jobs greater than 1,000 tons per mixture type for non-interstate routes or more than 500 tons per mixture type for interstate routes the following is required:
 - a. The Producer shall have an approved JMF for the specified mixture(s).
 - b. The Producer shall conduct asphalt cement (AC) content and gradation in accordance with the TDOT Specification Document / supplemental specifications.
 3. Small Quantities work orders/jobs
 - a. The Producer shall have an approved JMF for the specified mixture(s).

- b. Certification of compliance from the Producer stating all mixtures were produced and placed (if applicable) in full accordance with the TDOT Specification Document and this procedure.
- c. For all mixtures produced, the Producer shall submit daily reports on TDOT approved forms (DT-0267 and DT-1399) to the purchasing Authorized User's maintenance supervisor or project representative for each day's production. An asphalt material certification (DT-0293PG) shall be submitted to represent the asphalt material in the mixture.
- d. The mixtures shall be produced within the allowable tolerances specified in 407.20 of the TDOT Specification Document. Any mixture placed that is out of compliance as documented by the Contractors test results is not acceptable.

iii. Authorized User Pick-Up (Operational Hours)

- 1. It shall be the requesting Authorized User's responsibility to notify Contractor at least 24 hours prior to pick-up of asphalt at the Contractor's plant location during Operational Hours.

iv. Authorized User Pick-Up (Outside of Operational Hours)

- 1. Pick up at Contractor's plant after Operational Hours. After Operational Hours is defined as: between the hours of 8:00 p.m. and 6:00 a.m. Monday through Friday (Job must begin at 8:00 p.m. or later) and 24 hours a day Saturday and Sunday; including holidays and special events. Time zone is determined where plant is located.

B. In-Place (Delivery/Onsite) Specifications

i. General Specifications of Material

- 1. In-place is considered to be hot mix asphalt that is Contractor-produced and placed and compacted by the Contractor.
- 2. Material provided for in-place paving shall meet all specifications as defined above in Part A for Authorized User Pick-up.

4. In-Place – Roadway Requirement

Unevenness of texture, segregation (including end-of-load segregation), tearing or shoving of the bituminous mixture that occurs during the paving operation shall be reason to stop the paving until the condition is corrected. Skim patches and dragging of the aggregate shall be avoided.

A. Mix Placed by Contractor

- i. All work orders/ jobs greater than 1,000 tons or interstate jobs greater than 500 tons shall

be tested in accordance with Section 407.15 of TDOT Specification Document and meet the following requirements:

1. Density requirements: The Contractor shall provide a sufficient number of rollers and a roller pattern to achieve the densities specified below. If desired, the Contractor may request assistance from TDOT to aid in the development of establishing roller patterns; however, the Contractor retains all responsibility to achieve the density requirements specified in Tables 407.15-1 of the TDOT Specification Document.
 2. Testing Density for Acceptance: Density testing will be achieved by obtaining and averaging the test results of 5 randomly selected cores. Cores shall be taken by the Contractor at locations approved by the TDOT maintenance supervisor or Authorized User project representative and delivered to the Authorized User for testing. Cores shall be taken to represent an accumulated total of 1,000 tons (1 core for approximately 200 tons). Cores shall only be taken in sections where densities requirements are needed as stated above.
 3. Sections represented by densities not meeting the specification noted above will not be acceptable.
 4. Surface Requirements: Straight edge (Parallel to centerline)
 - a. Surface courses – with a 12' straightedge. The surface shall not deviate more than $\frac{1}{4}$ ".
 - b. Base Courses – Shall not deviate more than $\frac{3}{8}$ ".
 - c. The Contractor shall be required to repair all straightedge deviations as approved by the maintenance supervisor.
- ii. Small Quantities work orders/jobs
1. Density Requirements: the Contractor shall provide a sufficient number of rollers and a roller pattern to achieve the necessary compaction needed for adequate performance. The Authorized may use density measuring devices in determination of adequate compaction. The TDOT maintenance supervisor or Authorized User representative must approve or direct the compaction processes before work begins.
 2. Surface Requirements: Straight edge (Parallel to centerline)
 - a. Surface courses – with a 12' straightedge. The surface shall not deviate more than $\frac{1}{4}$ ".
 - b. Base Courses – Shall not deviate more than $\frac{3}{8}$ ".
 - c. The Contractor shall be required to repair all straightedge deviations as approved by the maintenance supervisor.

B. Tack Coat Application, Traffic Control, and Paving Location

- i. The Contractor shall apply tack coat material as specified in section 403 of TDOT Specification Document for Road and Bridge Construction, before each layer of asphalt is placed. Cost is to be included in the in-place price per ton.

- ii. Traffic control is to be furnished by the Contractor in compliance with the Manual on Uniform Traffic Control Devices (located at <https://mutcd.fhwa.dot.gov/index.htm>). All truck-mounted attenuators shall meet all recommended NCHRP #350 TL3 criteria for crash cushions. The Contractor shall be required to establish no passing zones in accordance with the Manual on Uniform Traffic Control Devices. Cost to be included in the in-place price per ton.
- iii. Paving location shall be plainly marked in the field and an Authorized User representative shall review the location with the Contractor prior to work proceeding.

5. In-Place – Pavement Materials

A. Pavement Marking and Paint Specifications

Commodity	Unit of
Enhanced Thermoplastic Pavement Marking (6 Inch wide)	Linear Mile
Pavement Marking (Water Based Paint)	Linear Mile
Pavement Marking (Highway Thermo-Plastic Specialty Pavement Marking)	Square Foot
Non-Highway Paving (i.e. Parking Lots) Thermo-Plastic Pavement Marking	Linear Foot
Non-Highway Paving (i.e. Parking Lots) Water Based Paint Striping	Linear Foot
Non-Highway Paving (i.e. Parking Lots) Thermo-Plastic Specialty Pavement Marking	Square Foot
Scoring of Flexible Pavement	Linear Mile
Spray Thermal Pavement Marking	Linear Mile

- i. Pavement markings shall be installed by the Contractor in accordance to the paint specifications detailed below.
- ii. Paint, meeting standard specification 910.02 in the TDOT Specification Document shall be applied by means of a machine of the spray type capable of satisfactorily applying the paint under pressure through a nozzle spraying directly upon the pavement. Drop-on type glass beads, meeting standard specification 910.02 shall be uniformly applied to the painted surface at a uniform rate of not less than six pounds per gallon of paint applied.
- iii. Water based paint shall be applied so as to deposit a uniform wet film thickness of 0.015 inches (within a reasonable tolerance), this is at the rate of 17 gallons per mile, for a solid stripe 4 inches wide. This rate of application shall apply to both types of pavement marking with proper adjustment made in gallons for an intermittent line or wide lines. The quantity of paint shall not under-run the designated amount by more than 5%, and if a check of the rate of application indicates a greater variation than this, the work shall be stopped until the paint machine is properly adjusted or replaced. Protection of traffic lines and markings shall be provided by the Contractor as directed by the State engineer.
- iv. The Contractor shall be required to duplicate all existing markings on all sections of paving at the end of each 24 hour period that exceed 100 feet in length.
- v. Thermoplastic pavement markings shall meet standard specification 716.03 and subsection 918.23 in the TDOT Specification Document. Authorized User may elect to

request thermoplastic markings on high ADT routes.

6. In Place – Material Transfer Device (Shuttle Buggy)

A. General Specifications - The Contractor shall be compliant with the following:

- i. Contractor shall provide a material transfer device with operator in front of paver at Authorized User's request allowing continuous operation on required sites.
- ii. Material Transfer Device shall meet or exceed TDOT Specification Document 407.06.B.

7. In Place – Non-Highway Paving

A. General Specifications

The Contractor shall be required to provide an estimate of total price based on line item prices to complete the job requirements. The estimate shall be a detailed list of all proposed work, to include the following:

- i. The estimated amount of tonnage (asphalt concrete lines and price per ton to place asphalt)
- ii. The hourly rates for job estimation and area preparation
- iii. Mobilization costs (UOM = EA, Price to mobilize)
- iv. Price per linear foot for thermo-plastic and water based paving marking
- v. Price per square foot for thermo-plastic specialty pavement marking
- vi. The Contractor shall not do any work until authorized by the Authorized User.
Upon Authorized User approval, the Contractor shall do the following:
 1. Contractor to remove all debris off Authorized User property in accordance with State and Federal Laws. The Contractor shall do any necessary work to prepare the area for paving.
 2. Base: The Contractor shall grade the area down to grade and compact with a roller (if applicable).
 - a. Paving: Install 2" of hot mix paving 411 E to TDOT Specification unless otherwise specified by requesting Authorized User; this means 2" or depth requested after the hot mix has been rolled.
 - b. Haul the mixture to the pavement area in dump trucks or other suitable conveyances, which shall be suitably covered to protect the contents from excessive temperature

loss. The loads shall have a temperature from 250 degrees F. to 350 degrees F. upon reaching the pavement. All loads failing to fall within the permissible temperature range are subject to rejection.

- c. The delivery conveyance shall dump the mixture into an approved self-propelled spreading and finishing machine. The machine shall spread the mixture smoothly, true to cross section and of a uniform density throughout.
 - d. Place asphaltic concrete mixture on prepared surface in accordance with good practice. Do not lay any asphalt where the weather conditions are unsuitable or unless the base is thoroughly dry and has set a sufficient length of time.
 - e. Roll as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted. Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density and has reached the finish grades.
 - f. During the course of work, the Contractor shall maintain a clean work area and upon completion of the work shall remove all debris and trash from job site. All work shall be accomplished by the Contractor as a turn-key operation. The Contractor shall be solely responsible for making his/her work to suit conditions encountered.
- vii. After completion of work, the Contractor and a representative from the Authorized User shall inspect completed work performed by the Contractor.
- viii. The Contractor shall have insurance in accordance with Terms and Conditions section 7.40.

8. In Place – Scoring Flexible Pavement

- A.** The work under this section consists of constructing scored pavement (rumble strips or rumble stripes) on paved highway shoulders by cutting into the finished asphalt surface. After the pavement has been scored, the permanent pavement marking shall be applied in the scored pavement.
 - i. The Authorized User representative will establish whether scoring will be placed as a rumble strip (pavement marking and scored pavement separate) or rumble stripe (pavement marking on top of scored pavement).
 - ii. Rumble strips shall meet [TDOT Standard Drawings](https://www.tn.gov/content/tn/tdot/roadway-design/standard-drawings-library/standard-roadway-drawings.html) T-M-15 and T-M-15A unless noted otherwise. Rumble stripes shall meet TDOT Standard Drawings T-M-16 and T-M-16A unless noted otherwise. TDOT Standard Drawings are accessible at <https://www.tn.gov/content/tn/tdot/roadway-design/standard-drawings-library/standard-roadway-drawings.html>.
- B. Method of Measure**

Scoring pavement shall be measured longitudinally along the edge of each individual scoring sequence.

C. Basis of Payment

The accepted quantities shall be paid for at the contract unit price per mile for scoring pavement which price shall be full compensation for all equipment, tools, labor and any other incidentals necessary to complete this work. The pavement marking material shall be paid for under other bid lines.

9. In Place – Spray Thermoplastic Pavement Marking

A. Special Provisions

The work shall consist of furnishing and applying a special formulated spray thermoplastic pavement marking as shown in TDOT Specification Document 716.03 and 919.02. The materials shall be a mixture of resins and other materials meeting EPA requirements for essentially non-volatile paint compounds developed for traffic markings. The marking shall be applied at a minimum of 40 mil thick and 4 inches wide.

10. In Place – After Operational Hours & Application of Asphalt

- A.** Contractor to deliver asphalt and apply to road way. Contractor shall meet all TDOT special provisions concerning night time operations Section 712, TDOT Specification Document for Road and Bridge Construction. Contractor shall be in compliance with the current version of Manual on Uniform Traffic Control Devices.
- B.** In addition to complying with standard specification 104.04 in the TDOT Specification Document, all in-place asphalt work in the following twelve (12) counties on State routes with greater than 30,000 ADT and all interstates shall be done at night between the hours of 8:00 p.m. and 6:00 a.m. Monday through Friday (Job must begin at 8:00 p.m. or later).

TDOT Region	Counties
Region 4	Madison and Shelby
Region 3	Cheatham, Davidson, Montgomery, Robertson, Rutherford, Sumner, Williamson, and Wilson
Region 2	Hamilton
Region 1	Knox

- C.** In other counties, standard specification 104.04 in the TDOT Specification Document applies and the Authorized User shall approve appropriate lane closure schedules. In addition, night work may be required in these other locations at the direction of the State engineer or equivalent.

11. Parking Lot Sealing

A. Basic Requirements

- i. The seal material shall be an approved polymer-modified material listed on the TDOT Qualified Products List (QPL) Section E, 40.005 (Pavement Sealers/Bituminous Surface Treatments) and the price shall include all aspects of installation within the region where the contract is

activated.

- ii. This work shall consist of sealing an existing Asphaltic concrete parking structure with a polymer-modified asphalt emulsion coating. This sealer shall be a highly durable skid resistant surface treatment that shall extend the service life of the parking structure.

B. Method of Application

- i. Contractor is to provide power brooms, power blowers, air compressors, water flushing equipment, and hand brooms capable of thoroughly cleaning all cracks and the existing surface. Contractor shall also provide hand squeegees, hand brooms, shovels, and other incidental equipment necessary to complete work in addition to mechanical spreading equipment as required by product specification.
- ii. Immediately before applying the sealer, Contractor shall remove all dust, dirt, vegetation, and other deleterious material from the existing surface by brooming, washing with water under high pressure, blowing with compressed air, or other manufacturer approved methods. Contractor shall also remove all thermoplastic pavement markings flush with the existing surface before applying sealer. Oil stains shall be cleaned and primed with a manufacturer approved Primer. Contractor shall obtain the Authorized User's approval before applying sealant.
- iii. Sealer shall be applied per the manufacturer's product specification. A copy of the product specification shall be delivered to an authorized engineer prior to commencement of work. Application rates shall follow the product specification recommended rates but may be changed at the direction of the Authorized User representative.
- iv. Where parking headers exist, the Contractor shall remove the headers during the cleaning and sealing process and replace upon completion of the work.

C. Materials

The sealant shall be listed on the TDOT Qualified Products List 40.005 Bituminous Pavement Treatments, [QPL 40 Section E](#). The Contractor shall furnish a certified statement from the Manufacturer of the sealant showing compliance with this specification.

D. Method of Measurement for Payment

- i. Sealer shall be measured and paid by the square yard.
- ii. Improper application such as over application or application in areas such as sidewalks and curbs shall not be accepted, and may result in non-payment of services on areas of improper application until corrected.

12. Specifications for Crushed Stone, Boulders, and Gravel

A. General Requirements

All contractor-provided materials are to be in conformance with the TDOT Specification Document and all subsequent supplements. In the event the State's engineer or other Authorized User representative finds the materials or the finished product in which the materials are used, or the work performed are not in conformity with the specifications, and have resulted in any inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected at the Contractors' expense.

- i. Duties of the Inspector: Authorized User personnel shall be authorized to inspect all work done and materials furnished. Such inspection may extend to all or any part of the work and to the preparation, or manufacture of the materials to be used.
- ii. Plant Inspection: The responsibility for securing satisfactory material rests entirely with the Contractor. The Authorized User may undertake the inspection of materials at the source of supply. This includes copies as required of all orders, shipping information, and other pertinent papers. Authorized User representatives shall have free and safe entry at all times to such parts of the plant as concern the manufacture and production of material.
- iii. Resampling and Testing, or Reinspection: At the option of the State, all materials are subject to resampling and testing, or reinspection at any time after delivery to the site of work, or to any batching plant. Such materials are subject to rejection if found unacceptable under these specifications.
- iv. Defective Material: All materials found to be unacceptable for any reason shall not be delivered to the site if rejected elsewhere, or shall be removed from the site or processing batch plant if rejected there.
- v. Public Convenience and Safety: Precaution shall be exercised at all times for the protection of persons and property. The safety provisions of all current applicable laws, OSHA regulations, building and construction codes, and the rules and regulations of the State Department of Labor and Workforce Development.
- vi. Rights of Way: The State shall be responsible for the securing of all necessary Rights of Way in advance of construction, except that the Contractor waives any and all claims for interference, delay, or damage if the Contractor accepts a limited work order or unconditional work order to proceed with the construction knowing that the Rights-of-Way have been only partially secured or that the Rights-of-Way are still encumbered.

B. Load Limitations

The Authorized User shall monitor the Contractor's observance of legal load limits in accordance with the following:

- i. For trucks with weigh tickets, a certified weigh ticket shall be furnished by the Contractor with each load. If the required certified weigh ticket accompanying a delivery indicates the truck's gross weight exceeds its GVWR displayed, the Authorized User representative may refuse receipt of the entire truck load. No compensation shall be paid to the Contractor for any material delivered, but not received, on any truck exceeding its GVWR.

C. Measurement of Quantities

All work completed under the Contract shall be measured by the engineer according to United States standard measure or the International System of Units ("S.I.", the Modernized Metric System) as indicated by the plant.

- i. Units of measurement and dimensions shall be shown in these specifications in both United States standard measure and S.I. (metric). TDOT shall utilize the hard conversion to metric units in lieu of a soft conversion. A hard conversion is a statement of a previous dimension in a convenient, rounded metric unit. For example, a hard conversion for 3 feet would be 1 meter. A soft conversion is an exact re-stating of a conventional U.S. measurement in metric terms. The previously stated dimension of 3 feet would be soft converted to 0.9144 meter. The unit of measure designated by the Contract, be it U.S. standard or metric, shall be the governing dimension for inspection, staking, testing, quantities, etc.
- ii. Unless otherwise specified, certified weights may be accepted for materials measured or proportioned by weight that are shipped by rail or truck transport, provided that only the actual weight of the material delivered is paid for.
- iii. In all cases where measurement of materials is based on certified weights, the Contractor shall be required to furnish the State certified weigh bills showing the net tons (metric tons) of materials received in each shipment. In no case shall the State pay for materials in excess of the amounts represented by the certified weigh bills.
- iv. The Contractor or materials Contractor shall employ a Certified Public Weigher as defined in the Certified Public Weigher Law of 1981, Tennessee Code Annotated, Section 47-26- 801, et seq., as amended. All applicable materials shall be measured in accordance with the Certified Public Weigh Law and Authorized User policy on scales approved by Authorized User personnel. Weight (haul) tickets shall be provided by the Contractor in accordance with Authorized User policy and as directed by an Authorized User engineer.
- v. Platform truck scales shall be a standard brand of scales, with a sufficient rated capacity to weigh the maximum load to which they shall be subjected. In no instance shall truck scales be used to measure weights in excess of the manufacture's rated capacity. The manufacturer's rated capacity shall be clearly posted on the scale manufacturer's plate and in the shelter provided for the weigher.

- vi. At the time of installation or modification of existing scales, the scales shall be tested and found to be within the allowable tolerances before accepted for use. Any alteration (Electrical readout, etc.) or change in the rated capacity shall be performed by a qualified scale technician. Such changes or alterations shall be documented by the scale technician and a copy of the documentation shall be furnished to the Authorized User upon request.
- vii. The recording mechanism of the scale shall be housed in a suitable shelter. The scale platform and scale pit shall be kept free of any debris that could affect the accuracy of the scales.
- viii. Digital readout and scale printers may be provided as the primary weight indicator or may be provided as accessory equipment. All scale control and recording equipment shall be subjected to inspection and approval by the State.
- ix. The scale shall be accurate within a tolerance of 0.5% and the value of the minimum gradation shall not be greater than 100 lbs (50 kgs). At each end of the platform scale there shall be a straight approach in the same plane as the platform. The approaches shall be of sufficient length and width to ensure the level positioning of vehicles longer than the scale platform during weight determinations. A truck and trailer shall be weighed with no brakes set on any wheel. The scale platform should be located so that the drainage of surface water will be away from it and to allow for adequate foundation of concrete or other approved materials. The foundation shall be constructed of sufficient strength and durability to withstand repeated capacity loading without affecting the accuracy of the scales.
- x. Purchasing Authorized User shall check the accuracy of their scales at their sole discretion. Whenever the scales cannot be checked within the time frame set by the Authorized User, designated Authorized User personnel may give tentative approval, based on check truckloads, weighed on other scales that are approved by TDOT or other State agencies.
- xi. Trucks used to haul material being paid for by weight shall be weighed empty at such times as the designated Authorized User personnel directs, and each truck shall bear a plainly legible identification mark.

D. Stockpiles

- i. The area for each stockpile shall be of adequate size, reasonably uniform in cross section, well-drained and cleared of foreign materials. Stockpiles shall be sufficient size to provide for a minimum of one day's operations. The aggregate stockpiles shall be placed on a firm, hard surface such as a compacted aggregate or stabilized base, bituminous or concrete, and shall be constructed by placing the aggregates in layers not more than one (1) meter thick.
- ii. Aggregates from the haul way areas shall not be used. The piles shall be located so that there

is no contamination by foreign material and no intermingling of aggregates from adjacent piles.

- iii. Aggregates from different sources and of different gradings shall not be stockpiled near each other unless a bulkhead is placed between the different materials. Aggregates of different gradings and from sources for use in blends shall be blended by proportion through the weigh hoppers. Aggregates found segregated or contaminated shall be rejected for use. A rejected stockpile may be reconstructed for further evaluation. Aggregates shall be removed from stock-piles in a manner such as to prevent segregation.
- iv. Aggregates which require washing shall not be used sooner than 24 hours after washing or until the surplus water has drained out and the material has uniform moisture content.
- v. Steel tracked equipment shall not be permitted on the stockpiles.

13. Crushed Stone Specifications

A. General Specifications

- i. Crushed stone is a form of construction aggregate, typically produced by mining a suitable rock deposit and breaking the removed rock down to the nearest size using crushers. It is distinct from gravel which is produced by natural processes of weathering and erosion, and typically has a more rounded shape.
- ii. Crushed Stone, Aggregate Gradings A thru E: Aggregates for Mineral Aggregate Base and Surface Courses shall be crushed stone, crushed slag, crushed or uncrushed gravel, crushed or uncrushed chert, crushed recycled concrete, or screened reclaimed asphalt pavement (RAP) together with such material as manufactured sand or other fine materials naturally contained, or added thereto as needed to conform with these specifications. The aggregate shall be of 2 Types: Type A and Type B.

B. Type A

- i. Type A aggregate for mineral aggregate base and surface courses shall consist of hard durable particles or fragments of stone, slag, gravel, or chert, and other finely divided mineral matter. Recycled concrete aggregate or reclaimed asphalt pavement, at a maximum rate of 25%, by weight, may be used for Type A aggregate, provided the contained aggregate blend meets all of the requirements specified below. The recycled concrete and asphalt shall be crushed and screened to produce a uniform stockpile before being blended with the virgin material. The recycled stockpiles shall be free of bricks, steel, wood, and all other deleterious materials. Individual, or blended materials shall meet the requirements specified below:
 - 1. Crushed stone shall be free of silt and clay. The coarse aggregate portion (retained on the No. 4 (4.75 mm) sieve) of the stone shall have a percentage of wear of not greater than

50, and when subjected to five alterations of the sodium sulfate soundness test, the weighted percentage of loss shall not exceed 15.

2. Crushed slag shall be free of silt and clay and shall meet the quality requirements of crushed stone. It shall be reasonably uniform in density and shall have a dry-rodded weight of at least 70lbs/c.f.
3. Gravel and chert shall be screened and all oversize material may be crushed and fed uniformly back over the screen. The coarse aggregate portion shall have a percentage of wear of not greater than 50, and when subjected to 5 alterations of the sodium sulfate soundness test, the weighted percentage of loss shall not exceed 15. The portion of the material passing the No. 40 (425 um) sieve shall be non-plastic, or shall have a liquid limit of not greater than 30 and a plasticity index of not more than eight.
4. If the aggregate, coarse aggregate or binder, in addition to that present in the base material, is necessary in order to meet the gradation or density requirements or for satisfactory bonding of the material, it shall be uniformly blended with the base course material at the mixing plant by a mechanical feeder to maintain a uniform flow on the belt in the mixer. Blending of materials on the stockpiles or in the pits by bulldozer, clamshell, dragline or similar equipment shall not be permitted.
5. The composite gradation of Type A aggregate shall be the grading specified.

C. Type B

- i. Type B aggregate for mineral base consist of crushed or uncrushed gravel, crushed or uncrushed gravel, crushed or uncrushed chert, crushed stone or crushed slag, and other finely divided particles. Recycled concrete aggregate or reclaimed asphalt pavement, at a maximum rate of 30%, by weight, may be used for Type B aggregate provided the combined aggregate blend meets all of the requirements specified below. The recycled concrete and asphalt shall be crushed and screened to produce a uniform stockpile before being blended with the virgin material. The recycled stockpiles shall be free of bricks, steel, wood, and all deleterious materials. The quality of Type B aggregate shall be the same as the quality requirements for Type A aggregate with the following exceptions:

1. The Sodium Sulfate Soundness shall not exceed 20. Type B aggregate shall be screened and the oversize materials may be wasted or crushed and returned over the screen and uniformly blended with the other material.
2. Material having a clay content greater than 12%, as determined by hydrometer analysis (AASHTO T 88), shall not be permitted. Material having a clay content not exceeding 12% shall be acceptable provided a plasticity index-fines product does not exceed 3 when calculated by the following formula:

$$\frac{\% \text{ Passing No.40(425 um)} \times P.I. \text{ of No.40(425 um) Material}}{100}$$

100

3. If an excess binder occurs, crushed stone, crushed slag, gravel, chert, sand, or other approved granular materials shall be uniformly incorporated in such proportions, not to exceed 20% of the total mix, as the engineer directs.
4. If the quantity of binder is insufficient to bond the base or surface course properly, additionally binder of approved quality, in an amount not to exceed 15% of the total mix, shall be uniformly incorporated as directed by the designated Authorized User personnel.
5. The use of material requiring the addition of coarse aggregate or binder in excess of the above limits shall not be permitted, unless otherwise specified by the purchasing Authorized User.
6. Blending of additional material, if required, may be performed either at the screening or mixing plant or on the road. If blending is done at the plant, mechanical feeders that shall maintain a uniform flow of the materials on the conveyor belt to the mixer or screening plant shall be employed. If blending is done on the road, the two or more materials shall be spread in uniform layers and blended by means of a mechanical mixer. Blending of materials on the stockpile or in the pit by means of a bulldozer, clamshell, or similar equipment shall not be permitted.
7. When combinations of materials for Type B aggregate for mineral aggregate base and surface courses such as creek gravel and chert, bank gravel and chert, crushed stone and chert, crushed slag and chert, are permitted, they shall be designated on the plans or in the Contract, and the pertinent requirements of this specifications for quality, blending of materials, and gradings shall apply.
8. The composite gradation of Type B aggregate shall be the grading specified on the plans or in the Contract.

14. Grading Table for Type A and Type B Aggregate for Mineral

Aggregate Base and Surface Courses

Total Percent by Weight, Passing Sieves					
Sieve Size	Grade A	Grade B	Grade C	Grade D	Grade E
2 ½ in (63mm)	100				
2in (50mm)	95-100	100			
1 ½ in (37.5mm)		95-100	100	100	

1in (25mm)		90-100	85-100	100
¾ in (19mm)	65-95		60-95	90-100
3/8 in (9.5mm)	35-65		45-74	50-80
No 4 (4.75mm)	35-55	30-55	40-65	
No 16 (1.18mm)	15-45		20-40	
No. 100 (150mm)	0-10	4-15	4-15	9-18
				5-15

A. Uses:

Crushed stone is a key material for macadam road construction which depends on the interlocking of the individual stone's angular faces for its strength. Crushed natural stone is also used similarly without a binder for riprap, railroad track ballast, and filter stone. It may also be used with a binder in a composite material such as concrete, tarmac, or asphalt concrete. Crushed stone is also used for driveways, drainage, and is often mixed with asphalt, placed around trees, landscaping, French drains, and as a sub-base for concrete sidewalks, concrete driveways, and patios, septic systems, and tracking pads for job sites.

15. Gravel, Crushed Chips, (No. 6, 7 or 8)

The crushed chips shall be machine crushed or machine ground from natural stone and shall be available in 6mm, 7mm, and 8mm sizes and in a variety of colors. Crushed chips can be used to decorate pavement, gardens, bathrooms, pools or fish tanks.

16. Gravel, Bank or Chert (CLS B, GRD C or D)

Gravel is composed of unconsolidated rock fragments that have a general particle size range and include size classes from granule- to boulder-sized fragments. Gravel is sub-categorized by the Udden-Wentworth scale into granular gravel (>2 to 4 mm or 0.079 to 0.16 in) and pebble gravel (>4 to 64 mm or 0.2 to 2.5 in). One cubic yard of gravel typically weighs about 3000 pounds (or a cubic meter is about 1,800 kilo-grams). Where natural gravel deposits are insufficient, gravel is often produced by quarrying and crushing hard-wearing rocks, such as sandstone, limestone, or basalt. Bank Gravel is a natural mound or exposed face of gravel, particularly such a place from which gravel is dug. Gravel is used to surface roads and to manufacture concrete.

17. Chert

Chert is a fine-grained silica-rich microcrystalline, cryptocrystalline or microfibrous sedimentary rock that may contain small fossils. It varies greatly in color (from white to black), but most often manifests as gray, brown, grayish brown and light green to rusty red; its color is an expression of trace elements present in the rock, and both red and green are most often related to traces of iron (in its oxidized and reduced forms respectively). "Common chert" is a variety of chert which forms in limestone formations by replacement of calcium carbonate with silica. This is the most abundantly found variety

of chert.

A. General Specifications

- i. Chert occurs as oval to irregular nodules in greensand, limestone, chalk, and dolostone formations as a replacement mineral, where it is formed as a result of some type of diagenesis. Where it occurs in chalk or marl, it is usually called flint. It also occurs in thin beds, when it is a primary deposit (such as with many jaspers and radiolarites). Thick beds of chert occur in deep geosynclinal deposits.
- ii. Cherts engineering problems: Cherts are subject to problems when used as concrete aggregates. Deeply weathered chert develops surface pop-outs when used in concrete that undergoes freezing and thawing because of the high porosity of weathered chert. The other concern is that certain cherts undergo an alkali-silica reaction with high-alkali cements. This reaction leads to cracking and expansion of concrete and ultimately to failure of material.

B. Uses

Chert is ubiquitous as stream gravel and fieldstone and is currently used as construction material and road surfacing. Part of chert's popularity in road surfacing or driveway construction is that rain tends to firm and compact chert while other fill often gets muddy when wet. However, where cherty gravel ends up as fill in concrete, the slick surface can cause localized failure.

18. Stone, Gabion (Spec Class A-1 Rip-Rap) Size 2in to 12in:

A. General Specifications

- i. Rip-Rap shall consist of stones as nearly as practicable in the form of right rectangular prisms. At least 50%, by weight, of the stones shall weigh in excess of 150 kg each, and the remainder of the stones shall weigh from 50 to 150 kg each. The gradation of materials furnished as rip-rap shall be accepted or rejected based on a visual examination of the material by the designated Authorized User personnel.
- ii. A gabion is a cage, cylinder, or box filled with rocks, concrete, or sometimes sand and soil for use in civil engineering, road building, and military applications. For erosion control, caged rip-rap is used. For dams or in foundation construction, cylindrical metal structures are used.

B. Uses

Gabions are used to stabilize shorelines, stream banks or slopes against erosion. Other uses include retaining walls, temporary floodwalls, silt filtration from runoff, for small or temporary/permanent dams, river training, or channel lining. They may be used to direct the force of a flow of flood water around a vulnerable structure. Gabions are also used as fish barriers on small streams:

- 1. 2" to 3" are used for bases beneath larger rip-rap products and sub-base courses.
- 2. 4" to 8" are used in stream bank stabilization, gabions, and pipe discharges.

3. 6" to 12" are used in stream bank stabilization and erosion control.

19. Boulders (Approximately 1 to 3 Feet)

A. General Specifications

Boulders shall be rounded or sub-rounded granite and limestone boulders.

B. Uses

Boulders are used for landscaping, ponds and retaining walls.

20. TDOT Regional Locations

The following is a list of Tennessee Department of Transportation Regional locations and points of contact:

Dept of Transportation - Region I
7345 Maintenance Lane
Knoxville, TN 37901
Attn: Kristin Qualls, 865-594-2350

Dept of Transportation - Region III
6601 Centennial Blvd.
Nashville, TN 37243-0360
Attn: Shay Deason, 615-350-4342

Dept of Transportation - Region II
7500 Volkswagon Dr. Build E.
Chattanooga, TN 37416
Attn: Adam Casteel 423-634-8680

Dept of Transportation - Region IV
200 Benchmark Place Build E.
Jackson, TN 38301-0429
Attn: Ross Sherwood, 731-935-0191